Report Information from Dialog DataStar

Table of Contents

A video eye tracking system based on a statistical algorithm.

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Abstract
Presents the design and analysis of an algorithm which determines the yaw, pitch, roll and **pupil** diameter states of an **eye** viewed with a standard video camera. A maximum likelihood estimation technique tracks the location and size of the **pupil** in a video image to find horizontal and vertical **eye** position. Simulations and analyses show that the noiseless measuring resolution of horizontal and vertical movements is less than 0.05 pixel on an image. Eased on accurate measurements of **pupil** position, counterroll movements are calculated using cross correlations between one dimensional templates which consist of equidistant pixels on a partial annulus overlying the iris and **concentric** with the **pupil** center. Another advantage of the algorithm is a robustness with respect to intrusions of droopy eyelids and random light reflections. Analysis shows that eyelids which cover **pupils** by less than a third of **pupil** radius do nor cause a bias in **pupil** position estimates. Light reflections on the **pupil** boundary have a minimal effect on estimate bias, while light reflections embedded inside the **pupil** have a lesser effect. The speed of image analysis (about 10 frames per second on Macintosh IIfx computer), the robustness for eyelid cover and random light reflections, and the ability to track 4 dimensional **eye** movement (horizontal, vertical, counterroll movement and **pupil** size) are major characteristics of the algorithm.

Descriptors
BIOLOGICAL–TECHNIQUES; BIOMECHANICS; **EYE;** MAXIMUM–LIKELIHOOD–ESTIMATION; TELEVISION–APPLICATIONS.

Classification codes
A8780 Biophysical–instrumentation–and–techniques*;
A8732 Physiological–optics–vision;
A8745D Physics–of–body–movements.

Keywords
video–eye–tracking–system; statistical–algorithm; maximum–likelihood–estimation–technique; **pupil–**position; counterroll–movements; equidistant–pixels; partial–annulus; iris; **pupil–**center; light–reflections; Macintosh–IIfx–computer; droopy–eyelids; random–light–reflections.

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Search Strategy

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1	INZZ	pupil$4 AND eye$1	unrestricted	1816
2	INZZ	concentric$4	unrestricted	14288
3	INZZ	1 AND 2	unrestricted	13

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